

Mammoth Creek
Forest Stewardship Plan



Appendix I- Common Trees and Shrubs

Trees of Southwest Utah

Source: Dave Roberts, Utah State University 2000

PINYON PINE

Pinus edulis Engelm.

DISTRIBUTION

- generally Colorado Plateau and vicinity
- Utah, Colorado, New Mexico, Arizona few other outliers

SITE CHARACTERISTICS

Temp and Moisture

- generally hot and dry
- mean annual precipitation 10-20 in
- precipitation primarily in growing season
- mean annual temps 40-60F, but often with extremes
- frost free season about 100-205 days, not frost tolerant
- tolerates high temperatures and high potential evapotranspiration
- drought tolerant, but long extreme droughts cause mortality

Substrate and Soils

- soils variable, but often gravelly or coarse textured
- typically occurs on sedimentary parent materials, but tolerates igneous or metamorphic

BIOLOGY

- shade intolerant, but stands rarely have closed canopy due to extreme root competition
- extremely fast root growth, up 15 cm in 10 days as seedling
- too much competition brings growth rates down, but there is little mortality and stands don't self thin.
- trees are capable of releasing from competition once established, but may die if released too early
- trees are generally not large (typically 12" DBH and 35-40') but may get as large as 36" DBH and 45'
- trees are generally slow growing, but often get to be 400 years old
- maximum age is at least 1000 years, and record tree is 68" DBH 69'

REPRODUCTION

- produces large wingless seeds (1400-2000/lb), with about 10-20 seeds/cone and up to 20 lbs/tree
- trees begin producing seeds at about 25 years, but don't really mature until about 75-100
- may produce seed for centuries
- cone crops either good or bad, rarely intermediate
- good crops occur every 4 to 7 years, often synchronously over large areas
- good crops seem to be favored by low temperatures in late August-early September
- seeds require almost three years to mature
- seeds fall under tree (or are removed from cones) and are dispersed by rodents and birds
- nutcrackers carry up to 55 seeds/trip up to 14 miles
- 150 birds can transport 3.3-5.0 million seeds/year
- seed viability high, but germination variable
- chilling 30-60 days improves speed of germination, but not percentage
- germination temperatures at least 40F and optimal 70F

- washing in water for 48 hours may improve germination
- in general, reproduction is limited by infrequent cone crops, harsh climate, rapidly declining germination, and loss of seed to predators
- best establishment is typically under nurse crops of juniper, shrubs, or pinyon

PESTS

- has several pests, but relatively few severe problems
- Ips beetles (two species)
- mountain pine beetle
- saw flies and defoliators
- more serious are cone insects and moths which wipe out some crops
- significant problem with pinyon dwarf mistletoe in some areas

MISC

- In general, pinyon stands develop slowly, with long-term BA increment at almost a constant rate.
- Height growth depends on site quality, tree height, and competition, but not age per se.
- These stands can continue growing indefinitely in BA, but reach a height max and plateau out.

SINGLELEAF PINYON PINE

***Pinus monophylla* Torr. & Frem.**

DISTRIBUTION

- Generally Great Basin Utah, Nevada
- very limited in Idaho, California

SITE CHARACTERISTICS

Temp and Moisture

- most xeric of all conifers
- precipitation 8-18"
- precipitation widely varying and unpredictable, occurring mostly in winter
- mean temps about 50F, mean max 86F, mean min 21F

Substrate and Soils

- best on coarse-textured slopes and bajadas
- not too choosy about parent material

BIOLOGY

- shade intolerant, but rarely grows in dense stands
- very slow growing, often taking 40-50 years to reach breast height
- maximum height often about 20-40'
- record trees about 42" DBH, 53' height
- stands show continuous slow growth with no culmination
- average about 1 sqft/acre/yr for >300 years

REPRODUCTION

- produces large wingless seeds that take two years to mature
- seeds 540-1500 seeds/lb

- 2-60 seeds/cone
- good viability, but short seed lifespan
- good seed crops every 3-7 years
- start seed production at about 35 years but do not produce abundantly until 100 years old
- seeds bird and rodent dispersed/cached
- requires a nurse crop to establish in many areas
- shoot growth slow, but root growth fastest of any Rocky Mountain conifer

PESTS

- dwarf mistletoe the biggest problem
- susceptible to fire in stands with sufficient fuel
- Ips beetle, mountain pine beetle attack, but usually minor
- cone insects can destroy seed crop
- defoliators ruin utility as Christmas trees

GAMBLE OAK **Quercus gambelii Nutt.**

DISTRIBUTION

- Mountains and foothills of Texas north to Colorado, west to SW Wyoming, S Utah, South to Northern Mexico

SITE CHARACTERISTICS

Temp and Moisture

- mean annual temperature 45-50F
- growing season about 140 days
- heat tolerance very high
- catkins and acorns are easily frost damaged if shoots have broken dormancy and frost or short growing season may limit the northern distribution of Gambel oak
- minimum moisture about 15-22" per year
- very drought tolerant

Substrate and Soils

- generally excessively well-drained, but not too particular about texture

BIOLOGY

- shade tolerant
- successional to big tooth maple, White fir, Douglas-fir, or Ponderosa pine if closed canopy
- individual stems older than 100 years are rare, but some stems up to 200 years
- size of Gambel oak is influenced largely by soil depth, with shrubby growth on shallow soils and tree growth form on soil > 12"
- You tend to get more smaller stems at lower elevation, and fewer larger stems at higher elevations.
- You often get clumps on slopes < 10%, thicker stands on steeper slopes
- usually small tree at the northern limits, but up to 54" DBH and 80 feet tall in New Mexico
- forms clones up to several acres in size, with stem densities from 2000 to 15000 stems/acre
- the rooting system is extensive and includes lignotubers (specialized storage structures) and rhizomes

- roots down to about 8 feet make up about 60% of the biomass

REPRODUCTION

- reproduction generally vegetative, especially in the north
- some reproduction by seed successful in the south, but rodents and birds eat a large portion of the acorn crop

PESTS

- fire trends to kill the aboveground stems, but sprouts like crazy

PONDEROSA PINE

Pinus ponderosa var. *ponderosa*

Pinus ponderosa var. *scopulorum*

Pinus ponderosa var. *arizonica*

DISTRIBUTION

- In our area we have all tree varieties. Var. ponderosa occurs only in Central Idaho. Var. scopulorum occurs in the Bighorn, Black Hills, and Medicine Bow Mountains of Wyoming, throughout the mountains of Colorado into New Mexico, central Arizona and the plateaus of Utah. Var. arizonica occurs in S. Arizona and S. New Mexico
- Ranges from 5500-9000 feet in elevation, with the best sites usually 7000-8000
- Typically forms lower timberline, and occurs up to mid-elevation forests

SITE FACTORS

Temperature requirements

- mean temperatures are 42-50F, but the yearly range of temperatures may be extreme
- requires a growing season of about 90 to 105 days
- photosynthesis is positively related to temperatures up to a fairly high temperature

Heat tolerance

- fairly high, up to soil temps of 130F or greater for older trees

Frost tolerance

- low during growing season, but cold hardens well during winter
- subject to redbelt if subjected to Chinook winds
- needles often winterkilled, but the buds are not, and survival is good even if growth is reduced
- seedlings subject to frost heaving on exposed soils

Moisture requirements

- typical sites 12-24" precipitation
- tolerates droughty soils well, but prefers moist well-drained soils
- prefers most of the moisture during the growing season
- often best growth on toe slopes where moisture accumulates from runoff or where deep roots reach down to the capillary fringe of water table

Drought tolerance

- very high, climax dominant on droughty soils
- occupies sites with highly variable moisture availability. Mean years may be suitable for other conifers, but occasional droughts favor Ponderosa pine

Excess moisture tolerance

- intolerant of saturated soils

Nutrient requirement

- fairly demanding, especially for calcium

Soils and substrate

- occurs on a wide range of soils, with a varying preference by geographic area
- generally prefers deep, well drained coarse or loamy soils from sedimentary parent materials, frequently limestone
- generally does not do well on metamorphic parent materials of igneous parent materials, prefers basalt
- soils under Ponderosa pine typically neutral or slightly acidic

BIOLOGY**Shade tolerance**

- shade intolerant, requiring 40-50% full sun (Aspen<Western larch<Ponderosa pine<Lodgepole pine<Douglas-fir)
- Ponderosa pine is rarely if ever light saturated, even isolated in full sun

Rooting habit

- deep rooted species, commonly 6-8' , but up to 30' observed
- laterals may go out 100' or more
- one of the fastest growing taproots of our seedlings

Shoot growth period

- variable by area, but generally starts early, although not as early as Lodgepole pine
- shoot growth period strongly dependent on temperature

Longevity and size

- 300-600 years typical for dominant and codominant trees
- commonly a large tree throughout most of its range

Cone crop frequency

- good crops every 3-4 years with light intervening crops
- best seed from dominants 24-28" DBH
- begins cone production at about 16 years and continues through 350
- seed from trees 60-160 years has the best viability
- most seed produced by open-grown trees

Seed characteristics

- fairly heavy seed (7000-23000/lb)
- average 60-90 seeds/cone
- large trees may average 14000 seeds/year
- good crops about 130000 seeds/acre, maximum about 350000 seeds/acre

Seed flight distance

- fairly short
- about 3-4 times crown diameter or 150' maximum

Seed distribution agent

- wind generally, also cached by rodents

Seedbed preference

- germinates best on mineral soil or loose soil with mixed organic matter, poor germination on clay soils

- survival best with light cover of needles in the S.W.

Germination rate

- affected by moisture stress and temperature, minimum temperature about 55F in the SW, early germination is essential (third week in July)
- root growth requires soil temperatures above 40F with best growth at 74F

Seedling growth rate

- root = 22" @ 1 year, 60" @ 4 years
- shoot = 3" @ 1 year, 12" @ 4 years

DISEASE AND PESTS

Fire resistance

- highly fire resistant when mature (best next to Western larch)

Windthrow resistance

- generally windfirm except on shallow soils

Bark beetle resistance

- attacked by mountain pine beetle, western pine beetle, red turpentine beetle and Ips

Disease

- dwarf mistletoe
- limb rust
- Armillaria root rot

MISC

- porcupines are a problem with girdling in some areas

LIMBER PINE **Pinus flexilis James**

DISTRIBUTION

- Limber pine generally occupies lower timberline sites in Montana, east central Idaho and eastern Idaho and western Wyoming, or rocky sites within the Douglas-fir series
- in Utah, generally occupies severe site within the upper Douglas-fir or Subalpine fir sites, but is somewhat bimodal
- in C and S Utah, again occurs at lower timberline on dry sites, but in association with Pinus longaeva
- in Colo, ranges from lower treeline to upper timberline where it forms a mosaic with spruce/fir

SITES

Temp and Moist

- these are generally the driest sites capable for supporting non-juniper conifers
- generally associated with a continental climate
- these sites experience extensive summer drought
- sites are generally chosen by nutcrackers, rather than Limber pine, and Limber pine is capable of good growth with straight boles and high crowns if planted on better sites

Substrate and Soil

- generally occurs on limestone or calcareous substrates, occas. Other sedi suchas sandstone

- Soils are generally skeletal

BIOLOGY

- needles in 5s, clustered near the branch tips
- cones 3-10", shed whole
- seed large and wingless or nearly so
- bark silvery smooth on young trees, blackish on older
- 30-50' and 15-24"
- long-lived 2500 yrs in southern Utah
- distinguishable from whitebark pine in some areas by color of male strobii, -gold in Limber pine and purple in Whitebark pine
- Limber pine is shade intolerant, but sites are often so dry that root competition prevents closed canopies
- often forms open mixed stands with Douglas-fir at lower timberline in northern Utah and eastern Idaho and western Wyoming
- Limber pine may act as the pioneer species on moderately xeric sites in Colo, with eventual dominance by Engelmann Spruce and Subalpine fir
- roots are deep and spreading
- Limber pine seems to maintain a reasonably high rate of gene flow by seed dispersal, despite rather severe restrictions to pollen exchange among populations at different elevations due to phenology

REPRODUCTION

- seeds are relatively large, and like Whitebark pine, wingless
- they are distributed by nutcrackers and rodents
- probably similar to Whitebark pine in many respects
- single-stemmed Limber pine is most common at lower elevations, with multi-stemmed forms becoming more common at higher elevations
- there is evidence that in Limber pine, multi-stemmed clumps are often genetically the same, or with 2-4 genetic individuals max. The multi-stem habit is thought to derive in part from leader damage
- high-elevation stands of Limber pine are extremely slow to regenerate, requiring several hundred years to achieve pre-disturbance densities

PESTS

- susceptible to white pine blister rust
- harbors a dwarf mistletoe in some areas

ROCKY MOUNTAIN DOUGLAS-FIR **Pseudotsuga menziesii var. glauca (Beissner) Mayr**

DISTRIBUTION

- geographically one of the most widespread conifers in the world, Canadian Rockies into Mexico
- widespread throughout Montana, northern Idaho, central Idaho, becoming somewhat more

restricted in the Northwest, Wyoming, Utah, Colorado, and scattered through Arizona and New Mexico

SITE CHARACTERISTICS

Temperature and Moisture

- covers a fairly wide range of sites, great genetic variability
- sites generally warm and moderately dry with occasional drought to cool and moist from areas of maritime influence to the strongest continental climates
- extends from lower timberline in cool dry areas up into the Subalpine fir zone
- Jan mean 16-32F July mean 45-70
- requires generally about 18" precipitation, climax up through some areas of as much as 35"

Substrate and Soils

- in many areas (Central Idaho, Montana) Douglas-fir shows no affinity for substrate, but in more marginal areas generally occurs on sedi PMs which are often calcareous
- generally avoids acidic igneous PMs, esp rhyolite and granite soils are generally loamy to fine textured and well-drained
- generally regarded as fairly nutrient demanding (esp phosphorus)

BIOLOGY

- moderate shade tolerance, Ponderosa pine<Lodgepole pine<Douglas-fir<Blue spruce<Engelmann Spruce<White fir<Subalpine fir
- better as seedling than as mature
- deep rooting if site is suitable, forms an initial taproot
- fairly long-lived (400yrs)
- grows fairly large 48" and 150' , more commonly 15-30" and 100-120'
- reasonable drought tolerant, not as Ponderosa pine

REPRODUCTION

- considered a fair to good seed producer
- some seed every year, fair to good 1/2 -1/3 of the time
- starts cone production at about 12-15 yrs, but best trees 200-300yrs
- seed is fairly light (25000-50000/lb), and wind dispersed
- seed flight distance about 250'
- seedbed preference is for generally light duff to prevent soil heating, and light shade while young
- once established, best in full sun

PESTS

- pretty good resistance to fire if mature, not as good as Western larch or Ponderosa pine
- relatively resistant to windthrow
- DF and spruce beetle is a problem
- tussock moth and spruce budworm defoliators
- DF dwarf mistletoe a serious problem in many areas

QUAKING ASPEN

Populus tremuloides Michx.

GENERAL

- Aspen is very different from most of the trees we will discuss. Not only is it a hardwood, but it is a clonal, with interesting genetic properties

DISTRIBUTION

- Aspen is the most widely distributed tree in N America
- in our area has a spotty distribution from lower timberline up to almost upper timberline with expansive stands in NW Wyo, Colo and Utah, with stands C Ariz and parts of N Mex as well occupies one million acres in Utah and Colo

SITE CHARACTERISTICS

Temp and Moist

- Aspen grows generally in cool climates with moderate precipitation and long winters which are not excessively cold
- actively grows from 39-97F, but does best from 50-60F
- Aspen generally occupies moist sites with precipitation from 16-40". The precipitation can be very misleading, however, as often occupies sites with subirrigation
- more typical precipitation might be 28-35"
- Generally, a compromise between moisture and growing season

Substrate and Soil

- occurs on a wide variety of PMs, but does best on shales, limestone, basalt, and other Pms which weather to produce fine textured soils
- does not do well on granite or other silicious rocks or coarse textured soils
- soils must be well-drained in the upper 2-3' , but are often subirrig
- generally nutrient demanding, but also serves as a good nutrient pump
- often associated with legumes (N fixers), and produces good litter

BIOLOGY

- Aspen is extremely shade intolerant, least of Rocky Mtn trees
- characterized by well developed fibrous, branching root system of large lateral roots with abundant sinkers
- laterals generally within the upper 2-3' and may be 100' , with sinkers to 7-9
- roots tend to form a dense mat if meet and obstruction
- Aspen cold hardens well when dormant, but is not frost tolerant during growing season.
- Suckers esp damaged by frost
- Aspen is not drought tolerant, but can often draw moisture from fairly deep in the profile when upper layers appear droughty
- Aspen stems are relatively short-lived (200 yrs depending on site), but clones may be thousands of years old

REPRODUCTION

- Aspen generally reproduces vegetatively from suckers
- suckers are capable of extremely fast growth, generally reaching DBH in 2-5 yrs
- suckers are subsidized by stored carbon in roots, and can therefore use energy not gained from photosynthesis
- the number of suckers depends on the stored carbon and site, sucker best in full sun after

- destruction of crown
- even when few aspen stems in stand, may have extensive root system to support extensive suckering
- after clearcutting may get 20,000-30,000 suckers/acre
- Aspen is also a prodigious seed producer, but very little reproduction from seed is observed
- seedlings need continually moist min soils seedbeds

PESTS

- Aspen easily killed by fire, but Aspen stands do not burn well, and sucker like crazy if burned. Good way to revitalize a stand
- generally windfirm, except for overmature stems with heart rot
- notorious problems with heart rots, generally consider to have a pathological rotation
- problems with needle miners and tent caterpillars, but not as severe as many species

WHITE FIR

Abies concolor (Gord. & Glend.) Lindl. Ex hildebr. Var. concolor

DISTRIBUTION

- Wasatch Mtns and plateaus of Utah,
- Kaibab, San Fran and Mogollon of Arizona
- San Juan, Sangre de Christo and Sacraments of Colo, and Nmex

SITE CHARACTERISTICS

Temp and Moist

- Generally occurs on cool mesic sites, but may occasionally occupy droughty sites as well
- northern extension may be limited by Jan mean temp of >32F, as apparently might also upper elev limit.
- Sites are characterized by generally even precipitation throughout the year
- precipitation generally >20", and typically >25"
- occupies sites on the moist end of Douglas-fir and the warm end of Subalpine fir

Substrate and Soils

- deep soils preferred, generally coarse textured and well-drained
- often colluvial
- often occurs on sedimentary PMs, esp. limestone and sandstone, but also occurs on a wide variety of soils in Ariz and Nmex

BIOLOGY

- intermediate shade tolerance Douglas-fir<Engelmann Spruce<White fir<Subalpine fir
- more shade tolerant as sapling than mature
- not frost tolerant in the spring
- generally not drought tolerant
- easily sun-scalded if exposed

REPRODUCTION

- cone crops about 2-4 years
- most cones on dominant trees, 12-36 best, peaks about 30"
- min age is about 40, best from 50-100 years

- 185 seeds/cone
- seed flight distance fairly short
- wind distributed mostly by Nov, but some into Dec
- germination rate about 50%
- no data on seedbeds GUESS partial shade from dead material
- growth slow up to 30 yrs
- may take 30yrs to reach DBH

PESTS

- easily damaged by fire
- easily windthrown esp after partial cutting
- spruce budworm a serious pest in some areas

BLUE SPRUCE **Picea pungens Engelm.**

DISTRIBUTION

- generally limited to central and southern Rocky Mtns, Colo, Utah, New Mexico and a little of Arizona

SITE CHARACTERISTICS

Temp and Moist

- generally occurs on cool, humid sites
- mean temps about 39-43F
- generally requires a frost free period of 55-60 days
- precipitation generally in 18-24" range with about 50/50 snow and rain or slightly more rain
- often occupies sites with subirrigation, however, so get more moisture than is evident in many areas

Substrate and Soil

- variable, but commonly rich, coarse alluvial or colluvial soils,
- does esp well on transported calcareous material
- generally tolerant of saturated soils and high water tables
- nutrient requirement believed to be relatively high
- sites are generally along stream courses or toe slopes where cool air and moisture accumulate
- often does not extend more that 30 yards from stream bank

BIOLOGY

- intermediate shade tolerance Douglas-fir<Blue spruce<Engelmann Spruce<White fir<Subalpine fir
- shallow rooting habit
- mature Blue spruce trees are frost and insolation tolerant, but seedlings are not
- most drought tolerant spruce, but subirrigation may make this misleading
- fairly slow growing tree, but long-lived (>600 yrs) and firly good size 18-22" @ 275-350 yrs

REPRODUCTION

- Blue spruce is considered a good seed producer
- cone crops generally 2-3 years,

- begins cone production at about 20 yrs, best from 50-150 yrs
- good crops seem to be favored by preceding warm, dry summer
- seeds are light, with a flight distance of about 300' seed are wind dispersed
- best seedbed is min soil, full sun above with side shade
- germination is induced by rainy season, so varies annually
- germination is pretty good, but establishment is poor
- seedlings susceptible to girdling from high soil temps, and are commonly frost-heaved
- seedlings growth rate fairly slow 6" @ 2 yrs, 24" @ 5 yrs
- 4-5" DBH @ 125-135 yrs
- root system especially slow to develop
- seedlings esp susc to spring drought of SW, more tolerant of later drought

PESTS

- not fire tolerant
- surprisingly windfirm given sites and root habit

ENGLEMANN SPRUCE **Picea engelmannii Parry ex Englem.**

DISTRIBUTION

- Subalpine forests of Rocky Mountains

SITE CHARACTERISTICS

Temp and Moist

- cool, humid climates with long cold winters and short cool summers
- short growing seasons (frost-free 30-60 days)
- mean temp 30-35F
- winter mins -50F
- precipitation > 24", mostly as snow

Substrate and Soils

- best on moderately deep well-drained soils
- prefers loamy or fine textured soils
- does not do well on sandy, shallow or excessively well drained soils
- in general, occurs on a variety of substrates if climate suitable
- occupies saturated soils in subalpine, excluding Subalpine fir from these sites

BIOLOGY

- shade tolerant, but not as tolerant as Subalpine fir (or according to Alexander, White fir)
- generally a shallow root system, usually 12-18", tap root only on juveniles
- root system dependent on site, however, and may be as deep as 8 feet
- seedlings susceptible to girdling from insolation in full sun
- susceptible to fall frost first year seedlings, spring frosts thereafter for several years
- seedlings strongly susceptible to frost-heaving
- mature trees cold harden extremely well
- low drought tolerance, but more drought tolerant than Subalpine fir
- Engelmann Spruce long-lived 500-600 yrs not uncommon

- reaches 40" and 160' , but more commonly 15-30" and 45-130' grows well for 300 yrs
- readily hybridizes with white spruce, but despite assertions to the contrary, does not hybridize with blue spruce

REPRODUCTION

- pollination occurs late May / early June
- seeds mature late August / early September, dispersed fall and winter
- moderate to good cone producer 2-5 yrs, but peaks at > 15" and 150-250 yrs
- good to bumper years 100000-500000 seeds/acre
- starts producing at 4-5' and 15-40 yrs, but peaks at > 15" and 150-250 yrs
- lose some seed (up to 30%) to cone insects and occasionally rodents
- production seems somewhat better west than east
- seedflight may be reliable to 600'
- seeds light, 135000/lb
- seed variability is about 70%, best of Rocky Mtn conifers
- viability positively associated with crop size
- germinates following snowmelt when air temp > 45F
- best germination on mineral soil or mixed mineral soil and humus, 40-60% sun
- tolerates low light better than any species except Subalpine fir
- variable results on burned substrate
- full sun leads to stem girdling, and open sites subject to frost-heaving, so partial shading is often essential
- also susceptible to frost in frost packets
- clipping of cotyledons by birds a significant problem in some areas
- around 650 seeds/seedling required, and 6800 seeds/4-year-old
- will reproduce by layering
- seedling growth is slow, especially root system 3-4" @ 1 yr max
- reaches DBH around 10 yrs good site in Utah, 6-8' @ 10 yrs COLO

PESTS

- susceptible to fire, thin bark and persistent branches
- easily windthrown, especially after partial cutting
- in recent years spruce beetle has again caused massive problems in some areas
- susceptible to a fairly wide variety of fungi

VEGETATION

- forms the Engelmann spruce - subalpine fir SAF type, and occurs in 15 other SAF types throughout its range
- generally long-lived seral or co-climax with AFLA (or corkbark fir in the south) throughout the Rocky Mountains
- often associated with seral Douglas-fir, lodgepole pine, limber pine, aspen, white fir, blue spruce, and in the south southwestern white pine
- forms nearly pure stands as the climax dominant in cold relatively dry areas of southern Colo and Nmex
- post-disturbance successional development of spruce-fir forests depends greatly on the initial vegetation. Engelmann Spruce returns much more quickly with shrubs or trees than with grass
- PINE supports high leaf areas / basal area, but has lower leaf area/sapwood than Subalpine fir

- Engelmann Spruce has very high transpiration rates, and uses significantly more water over a year than other associated tree species

UTILITY

- good sites often support 25000-40000 bd ft/acre, with rare sites supporting greater than 80000
- stand growth rates vary from little or none to greater than 200 bd ft/acre/year in unmanaged stands to as much as 600 bd ft/acre/yr for short periods on managed stands
- wood is light and soft, but easily worked despite numerous small knots. Commonly used for studs and poles, sash, and musical instruments. Easily pulped

SUBALPINE FIR

Abies lasiocarpa (Hook) Nutt. var. lasiocarpa
var. arizonica (Merriam) Lemm. Corkbark fir

DISTRIBUTION

- widespread throughout subalpine forests of Idaho, Montana, Wyoming, Colorado and Utah, and dominant in the relatively small area of subalpine in Arizona and New Mexico
- corkbark occurs SW Colo, Nmex, and high Mtns of Ariz

SITE CHARACTERISTICS

Temp and Moist

- generally the coolest and moistest sites in the Rockies
- mean annual temps around 25-40F, July mean of only 45-60
- precipitation generally >24", mostly snow
- these sites characterized by abundant moisture during a short growing season (frost-free periods 30-60(75) days), and long very cold winters
- Subalpine fir generally intolerant of extended warm temps, lower elev limit generally temp enforced however, will tolerate warm days up to 90

Substrate and Soils

- Subalpine fir is not too picky. Generally, most sites within the temp and moisture regime will do however, does best on relatively fine textured soils derived from shale, basalt does less well on coarse soils from granite e.g. often makes best growth on toe slopes where deposition of finer material accumulates

BIOLOGY

- Subalpine fir is the one of the most shade tolerant trees in the Rockies
- Douglas-fir < Engelmann Spruce < White fir = Subalpine fir
- generally shallow root habit, but somewhat dependent on site
- Subalpine fir is generally frost tolerant, as frosts may occur any month within the range of sites
- is not drought tolerant, but drought very uncommon at this elevation
- fairly tolerant of excess moist, but less than Engelmann Spruce
- Subalpine fir is not especially long-lived (although >250yrs not uncommon), often suffers pathological rotation
- may get to be 30" and 130' , but more typically 12-24" and 45-100'

- Subalpine fir has a very large leaf area/sapwood ratio, although a lower leaf area/ basal area ratio than Engelmann Spruce
- has relatively slow transpiration rates driven by vapor pressure deficits and light. It is less sensitive to water stress, which may influence its site requirements

REPRODUCTION

- Subalpine fir is fair to poor seed producer in our area, although does much better farther north
- begins to produce seed at 4-5' and 20 yrs in open, but much later in canopy
- corkbark no cones before 50
- maximum seed production from dominants 150-200 yrs old
- also layers fairly well
- seeds fairly large lasiocarpa 34000/lb, corkbark 22000/lb.
- seed flight distance about same as Engelmann Spruce
- seed distributed all wind; upslope winds important in some areas
- pollination late spring/early summer
- seed dispersed in September and October
- germination is fair at best (34%), and seed viability is short-lived
- germination may be enhanced by stratification in moist sand at 41F for 60 days
- seeds germinate in spring after overwintering under snow
- not too picky about seedbed, but best on mineral soil or moist humus
- can establish through duff, however, and is often successful where other species are not
- Subalpine fir is very tolerant, but does not compete well if light is very available
- seedlings also subject to head girdling from sun
- on the order of 700 seeds/seedling required for successful establishment
- after three years, does pretty well
- corkbark fir is often very slow to reproduce after fire or burning, requiring > 100 years of succession before successful establishment
- seedling growth is slow, requiring 20-40 years to reach DBH in many areas

PESTS

- easily damaged by fire at all ages, thin bark, branches to ground
- easily windthrown, especially in partial cuttings
- often windthrown form root rot
- subject to a variety of fungi, many of which are not fatal, but which weaken the tree making it susceptible to windthrown or other problems
- often hit by western spruce budworm and locally by fir engraver
- outside our area (at present) the balsam wooly aphid is extremely destructive
- probably modest cone predation by mammals

VEGETATION

- Subalpine fir is the climax dominant throughout most of its range in the Rocky Mountains. In Montana it is sometimes mixed with mountain hemlock (*Tsuga mertensiana*) which is more tolerant
- The Subalpine fir series is extremely widespread and diverse
- Subalpine fir forms the SAF Engelmann spruce-subalpine fir cover type, and occurs in an additional 16 cover types throughout its range
- in our area, at its lower elevation limits, it is often associated with seral Douglas-fir, aspen, lodgepole pine, and in some areas blue spruce or white fir, in addition to co-climax

Engelmann spruce at higher elevations it is often associated with seral lodgepole pine, limber pine, whitebark pine, or bristlecone pine

UTILITY

- corkbark fir was once considered as an emergency source of cork
- despite being the dominant tree in many stands, due to smaller size often comprises relatively small portion of total stand volume
- wood is relatively soft and weak, but light and easy to work. It can be suitable for pulping

Additional Tree and Shrub Descriptions

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GYMNOSPERMS

Gymnospermae

This group is also commonly referred to as conifers, however there are notable differences between these two groups as not all gymnosperms are conifers, or cone-bearing trees. Their developing seeds are naked, or they are not enclosed and grow on the surface of cone scales.

Pines-pinus

Pines grow in many different habitats around the world. Characteristics include having woody cones bundles of needles. One of the ways to determine pine species are by how many needles are contained in each needle fascicle group (1, 2, 3, or 5 needles). This group is also sometimes broken down into white pine and yellow pine groups. A white pine will usually have needles of 3 or 5, whereas yellow pine typically have needle groups of 1 or 2. Many pines are important commercial timber species, most notably Ponderosa Pine. Pine species are shade-intolerant, and are sun-loving. As a general rule they need full sunlight and an exposed mineral seed bed to become established naturally from seed. Pine are typically found on dry, exposed sites and need disturbance (wildland fire) to be maintained as the dominant tree species for a given site. Pine are long lived, but are susceptible to insect and disease attacks where there density is high and moisture levels are low. Pine are usually fast growing, especially compared to other conifer species and are found in many different locations. Pine have flat, flexible needles that are pointed at the tip.

Limber Pine-pinus flexilis

(flexilis meaning flexible)

*Needles about 2 ½ in. long, dark green, stout and rigid

*Cones 3" to 10" long, cylindrical, light brown, without prickles and with thickened scales

*Bark is silvery white to light gray on young and brown to nearly black on old and separated by deep fissures into rectangles/squares

*Typical mature growth is 30 to 50 ft. with a 15 to 24 inch DBH.

*Elevation range is between 7,500 and 12,000

*Usually found in the high mountains. The branches are limber and can be bent without breaking

Great Basin Bristlecone Pine-*pinus longaeva*

(longaeva meaning long-lived)

- *Needles are about 1" long, come in groups of five, are short and soft
- *Cones are 3-5 inches long, oblong, and have diamond shaped cone bracts
- *Bark small, light, platelet shaped bark
- *Wood is extremely dense and heavy
- *Can reach 15-30 feet and up to 60 feet in favorable conditions
- *Elevation 7,500-11,500 in thin, rocky soils
- *This is the longest lived pine species in Utah, some being many thousands of years old.

Singleleaf Pinyon-*pinus monophylla*

(monophylla meaning single needle)

- *Needles are single, unlike other pines, evergreen in color, and seeds are wingless
- *Elevation from 2,000 to 8,000 feet in dry sites
- *Main use is for the pine nuts that are eaten raw or roasted, fence posts and firewood

Colorado Pinyon-*pinus edulis*

(edulis meaning edible)

- *Needles are 1-2 inches long, deep green, fairly stiff, and arranged in two's
- *Cones are 1-2 ½ inches long, oval to round, and reddish-brown
- *Twigs are fairly stout, orange to brown color
- *Bark is fairly thin and ridged
- *Found on dry sites
- *Elevation semi-arid rocky places
- *This is the most famous of the pinyons for its tasty nuts, fragrant wood smoke, and sprawling beauty.
- *Characteristically a low elevation tree

Western White Pine-*pinus monticola*

- *Needles are 2" to 4" long, blue-green, five to a bundle, slender and flexible
- *Cones are 5" to 15" long, narrowly cylindrical, often curved, reddish brown, frequently mottled with black
- *Twigs are moderately slender, dark reddish brown to purplish brown, and cylindrical
- *Bark is smooth gray-green to light gray on young trees, thin, breaks up into square or rectangular, dark-gray or purplish-gray blocs separated by deep fissures
- *Grows to 150-180 ft. with a base of 2 ½ to 3 ½ in places where the air is cool and clear

Ponderosa Pine-*pinus ponderosa*

- *Needles 5" to 11" long, in bundles of three's, dark gray-green to yellow green, flexible, and when crushed have a turpentine odor
- *Cones are 3" to 6" long, ovoid to ellipsoidal, green but turn brown, and solitary or clustered
- *Twigs are stout and exhale a turpentine odor when bruised
- *Bark is brown to black and deeply furrowed on vigorous or young trees, fire resistant, and is yellowish brown to cinnamon-red on others

- *Growth is 150 to 180 ft. with a 3 to 4 foot base in diameter
- *Elevation is from 6,000 to 9,000 feet
- *Adapted to areas that have frequent, light fires

Lodgepole Pine-*pinus contorta*

(contorta meaning contorted or twisted needles)

- *Needles are 1" to 3" long, dark green to yellowish green, and often twisted
- *Cones are 3/4" to 2" long, opening at maturity or remaining closed for many years until opened by fire, and are tawny to dark brown
- *Twigs are moderately stout, dark red-brown to nearly black
- *Bark (on mountain trees) about 1/4" thick, orange-brown to gray, covered by thin, loosely appressed scales
- *Growth is a medium-sized tree from 70 to 80 ft. high and 15 to 30 in. at the base
- *Best development is in a moist but well-drained sandy or gravelly soils. Growth occurs anywhere from 1500 to 11,500 feet of elevation in dense stands.
- *In pure unmanaged areas, lodgepole grows into its trademark "dog hair" stand which is dense and void of ground vegetation. Because of this, growth form they are ideal for tee-pee poles.
- *Cones may be serotinous, which means they remain shut until heat, usually from a fire releases them which in turn forms a new and very dense stand.

Firs-*abies*

Includes about 40 species with nine found in the US and found in forests that are cool and humid due to high elevation. Fir is very shade tolerant and prefers the shade and protection of overhead vegetation to become established. Because of this, in the absence of disturbance, fir may become the dominant tree species as it shades out pioneer tree species. Fir is used for wood production, but is usually of low value due to its poor tensile strength. Cones of fir are not usually identifiable on the forest floor because they disintegrate on the tree when seeds are shed. A fir cone is fleshy, not woody and the needles are short and rounded at the ends, which makes them pleasant to the touch - hence fir. Young trees typically have smooth gray bark with resin blisters that emit sap when poked. Older trees display more typical bark of conifers.

Subalpine Fir-*abies lasiocarpa*

- *Leaves are 1" to 1 3/4" long, flexible, soft, blunt, and pale blue-green
- *Cones are 2 1/4" to 4" long, cylindrical, purplish gray to nearly black in color and fall apart leaving spike-like cores
- *Bark is smooth and chalky on young stems; furrowed and scaly on old trunks; usually has blisters that contain up to half a teaspoon of sticky resin
- *Tree is easily identified by the crown which is narrow and very pointed
- *Growth is 60 to 100 ft with a diameter of 18 to 24 in.
- *Elevation is 7,000 to 11,500 feet in deep, moist soils
- *Diseases include annosus which attacks the root and quickly digests the tissues of living roots

White Fir-*abies concolor*

- *Needles are 2" to 3" long, silvery-blue to silvery-green, broad, flat, blunt and extend at right angles from all sides of the twig
- *Cones are 3" to 5" long, oblong, and olive-green to purple

- *Twigs are moderately stout, yellowish green to brownish green with yellowish brown buds
- *Bark is 4" to 7" thick on old trunks, smooth, ashy gray and divided by deep irregular furrows
- *Grows to be 130 to 150 ft.tall under ideal conditions with a 3 to 4 ft.diameter base in moist, well-drained soil
- *Elevation is from 5,000-7,000 in canyons and 8,000-11,500 on slopes
- *Often used for Christmas trees

Spruces-*picea*

Usually restricted to cooler regions of the Northern Hemisphere and includes 40 to 45 species. Spruce is another shade tolerant tree species and prefers cool, moist locations. Spruce needles are easily identified as they are short, square and sharply pointed at the tip. Spruce crown are usually dense with foliage, and older limbs may droop. Cones are medium to small sized and are leathery, with cone scales extending at nearly right angles from the stem of the cone. The tips of the cone scales are smooth and when rubbed it reminds many of running a thumb or finger down the teeth of a hair comb. Bark of spruce is usually dark with tiny platelets on older trees.

Blue Spruce-*picea pungens*

(*pungens* meaning sharp needles)

- *Needles are dull dark green to blue-green, stiff, sharp, extending at right angles to the twig and when chewed have a sharp, acidic, pungent taste
- *Bark is pale to dark gray on mature trees
- *Twigs are glabrous
- *Cones grow to be about 3" or more long with narrow scales and papery feel
- *Grows to be 70 to 90 feet tall with a 2 foot base in moist soils due to shallow roots
- *Elevation is from 8,000-11,500 feet
- *Used as Christmas and ornamental trees
- *State tree of Utah

Engelmann Spruce-*picea engelmannii*

- *Leaves are 1" to 1 1/8 " long, linear, 4-sided, blue-green, flexible, and tend to point toward the tip of the twig
- *Cones are 1" to 2 1/2" long, ovoid-oblong, scales are thin and papery, and wedge shaped
- *Twigs are light brown to gray
- *Bark very thin, broken into large purplish brown to russet-red, thin, loosely attached scales
- *Growth is between 100 and 120 ft.and has a base of 18-30 inches on north-facing slopes usually
- *Elevation is from 8,000-11,500 feet
- *Best grown in deep, rich, loamy soils of high moisture content and is also an indicator of a climax forest
- *Has relatively shallow roots, and dense forest stand which are cut too heavily are subject to loss from windthrow.
- *The most common spruce found in Utah

Douglas-Fir-pseudotsuga

Readily distinguished by their pointed buds, and persistent cone scales. Also, pseudotsuga means false hemlock. This is the most important commercial lumber species in the northwestern United States, but is commonly found in the Intermountain west. Douglas-fir is often found on north facing slopes in transition zones between higher elevation forested areas and rangelands. The crown of douglas-fir is open and has voids that can be seen through at a distance. Douglas-fir bark is gray to brown and almost looks “corky” when the tree is young. Needles of douglas-fir are similar to true fir species, although they are usually smaller. The easiest way to identify douglas-fir in the field is by observing cones which fall close to the tree that produced them. Under each cone scale is a bract which looks like the haunches and tail of a mouse or rat which was trapped under the scale. This characteristic alone can easily identify this economically important and beautiful Utah tree.

Douglas-Fir-pseudotsuga menziesii

- *Leaves are 3/4" to 1 1/4" long, yellow-green or blue-green, blunt, flexible, flattened and standing out from all sides of the twig
- *Cones are 3 to 4 inches long, ovoid-cylindrical, and mature at the end of the first season
- *Buds are fusiform, sharp-pointed, and lustrous brown
- *Bark becomes 6 to 24 inches thick on old trees and reddish-brown
- *Grows to about 130 feet
- *Elevation from 4,000-11,000 in deep soils and requires plenty of sunlight
- *It's most distinguishing feature is the three-prolonged bract that projects beyond the edges of the cone scales and has long, shiny, brown, pointed buds

Junipers-juniperus

Ranges from low shrubs to venerable trees. They're found in the Northern Hemisphere usually amongst pines. The cones are aromatic and look like a frosted blue-gray berry at mature age. When considering acreage distribution, junipers may be the most common tree genus found in Utah. Junipers are well adapted to rangeland sites and readily grow to form thousands of areas of woodland areas in Utah. Considered a weedy tree, junipers are often chained or cut and then burned to remove them, which increases range forage for livestock. The needles of juniper are allopathic and hinder grass production underneath their dense, compact crown. Junipers are used most for fence post due to their tough, decay resistant wood and vast availability. Junipers reproduce readily and often invade grass and sagebrush sites due to their adaptation to extremely dry sites. Junipers are often called “cedar” trees as their decay-resistant and aromatic wood resembles wood used in making cedar chests.

Utah Juniper-juniperus osteosperma

- *Leaves are yellowish green, scale-like, and have the feel of coral not yet hardened
- *Bark is thick and red-brown in color that sloughs off in shaggy, fibrous strips
- *Branchlets are stiff and stout
- *Berries are marble size (larger than most junipers), reddish brown or bluish with a powdery coating, mealy, and fibrous
- *Growth usually not over 30 feet or 30 inches in diameter
- *Elevation is from 3,000-8,000 in dry, rocky places
- *Usually quite bushy and most predominant species of tree in the Southwest

*Produces male and female cones on the same tree

Rocky Mountain Juniper-*juniperus scopulorum*

- *Needles are smaller than Utah Junipers, and scale-like
- *Berries have 2 or 3 seeds, pea-size, blue, frosted, and edible
- *Bark is reddish brown to gray, scaly, and stringy
- *Growth is rarely over 30 or 40 feet or 2 feet in diameter
- *Elevation is from 5,000-9,000 feet and grows on low, rocky, mountain slopes and dry mesas

Common Juniper-*juniperus communis*

- *Needles are awl shaped, in groups of 3, rather prickly, and stand out from stems
- *Bark is reddish brown, thin, soft and scaly
- *Wood is durable, weak, close-grained, and aromatic
- *Fruits are dark blue, juicy, and pea sized
- *Growth is about 3 feet tall
- *Elevation is from 5,000-10,000 feet on dry, open, rocky mountainsides; sometimes in partial shade

ANGIOSPERMS

angiospermae

These are the most common, most complex, and most widely distributed plants now inhabiting the earth's surface

Cottonwoods and Poplars-*populus*

These are fast growing, short-lived, tall trees. In Utah, poplars inhabit many different forest zones and locations. On rangeland sites, poplars are usually found in riparian zones as they are water-loving trees. The term cottonwood and poplar are used interchangeably, and these fast growing trees are often used for windbreaks in harsh climates.

Quaking Aspen-*populus tremuloides*

(tremuloides meaning trembling or quaking aspen)

- *Leaves are 1 ½"-3" in diameter with green, lustrous surfaces above and duller below, and turn a bright yellow in autumn
- *Fruit is about 1/4" long, narrowly conical, and curved
- *Twigs are slender, lustrous, and reddish brown
- *Bark is smooth, greenish white to cream-colored, at length furrowed, dark brown or gray and often roughened by numerous wartlike excrescences
- *Growth is from 50-60 feet with diameters of 1 to 2 feet maximum
- *Elevation is from 6,000-11,500 feet in moist, sandy soils
- *In Utah quaking aspen grows in clones, where an entire stand is actually one living organism
- *Aspen reproduce almost entirely by sending suckers out from the underground root system
- *Aspen is highly susceptible to fungal infection and mushroom conks appear in old age

Narrowleaf Cottonwood-*populus angustifolia*

- *Leaves are yellow green in color above, but lighter beneath, and roundish
- *Twigs are round and greenish
- *Growth is 50-60 feet tall and 12-20 inches in diameter
- *Elevation from 4,000-8,000 on stream banks and valleys
- *Often mistaken for a willow
- *All cottonwoods bear the male and female flowers on different trees
- *They get there name from the mature female seeds that are covered with white fuzzy cotton

Fremont Cottonwood-*populus fremontii*

- *Leaves are broad, triangular, wit coarse, rounded teeth, long, flattened stalks, and turn golden yellow in the fall
- *Growth is at most 90 feet high and 5 feet in diameter
- *Elevation is from 2,500-7,000 in river valleys and on riverbanks
- *One of the most common, native Utah cottonwoods

Birches-*betula*

Smooth-barked, small-leaved, slender trunked trees and shrubs. Male and female flowers are arranged on the same tree in separate catkins.

Water Birch-*betula occidentalis*

- *Leaves are 1"-2", thin, dull green, nearly oval, doubly toothed, and turn golden yellow in the fall
- *Bark is shiny red brown, cherry like, and is broken by horizontal markings
- *Twigs are roughened by the numerous warty glands that are on the surface
- *Fruits are like miniature pinecones, solitary, cylindrical, and disintegrate when mature
- *Growth is from 10-25 feet high wit a diameter of 10 inches
- *Elevation from 5,000-9,000 feet in stream banks and moist locations

Oaks-*quercus*

Consist of about 500 species in the world. They have simple leaves that are alternately arranged.

Gambel Oak-*quercus gambelii*

- *Leaves are 2"-7" long and 1½"-3½" broad with 7-11 lobes, upper surfaces are smooth whole under surfaces are hairy, yellow-green in spring and deep red in fall
- *Fruit is oval acorns about 1 inch long
- *Bark is grayish, rough, hard, and becomes fissured with age
- *Growth is clumpy (several stems in one location) usually small and usually less than 10 feet
- *Elevation is from 4,000-8,500 feet on dry hillsides and slopes
- *The most common oak species in Utah
- *Excellent for firewood

Cherries-*prunus*

The Rose Family.

Chokecherry-*prunus virginiana*

- *Leaves are thin, yellow-green that turn yellow with red patches in the fall
- *Bark is reddish on young trees
- *Fruit are about 1/4" inch in diameter that turn from green to bright red
- *Flowers are white with five petals in cylindrical clusters 3-4 inches long
- *Grows to a height of about 15 feet
- *Elevation is from 4,500-9,000 feet on hillsides, stream sides and canyons
- *Called a chokecheery due to the bitter taste of the fruits

Maples-*acer*

Leaves are arranged on the twig in opposite pairs and are palmate in shape.

Boxelder-*acer negundo*

- *Leaves are 3-4 inches long, glabrous, divided into 3 to 7 coarsely toothed leaflets that are light green and turn pale yellow in the fall
- *Flowers are yellow-green and appear with or before the leaves
- *Fruit is 1-2 inches long, ripens in the fall, has double winged seeds that help identify it as a maple and is born on slender stems
- *Twigs are stout, green to purplish green lustrous
- *Bark is greenish to light brown and smooth on new twigs but pale grayish brown and cracked on old trunks
- *Wood is light, soft, weak, close-grained
- *Growth is usually from 10-15 feet
- *Elevation is from 3,500-8,500 on streambanks and moist land
- *Able to withstand extremes of temperature and drought.
- *It grows quickly but is short-lived.

Canyon Maple-*acer grandidentatum*

- *Leaves are 3-5 inches wide and long, 3-5 lobed, bright green and glabrous above and paler with fine hairs beneath
- *Twigs are slender, glabrous and red
- *Bark is gray-brown and shallowly furrowed
- *Brilliant fall coloring is due to special pigments in the leaves that is masked by the chlorophyll.

Rocky Mountain Maple-*acer glabrum*

- *Leaves are maple like with 3-5 lobes, coarsely toothed edges, red leaf stems and are shiny green on the top and paler green below
- *Fruit is a pair of parchment like wings joined together
- *Bark is light gray to gray green and is smooth
- *Growth is from 20-30 feet with a trunk of 6-12 inches in diameter
- *Elevation from 5,000-10,500 in moist, deep soils of canyons & mountain sides

Other Shrubs:

Bitterbrush-*purshia tridentata*

- *Leaves are about 1 ½ inches long, 1/8-1/4 inch wide, wedge shaped, and silvery to gray
- *Blossoms from April to August and are pale yellow, fragrant, and tiny
- *Growth is from 2-10 feet
- *Elevation is 3,500-9,000 feet on dry, usually rocky hillsides and slopes

Oregon Grape-*mahonia repens*

- *Leaves are hollylike
- *Flowers are yellow
- *Fruit is purple and grapelike
- *Growth is from 1-2 feet tall
- *Elevation is from 4,000-9,000 feet on semi-dry sites
- *Drought tolerant once established

Curlleaf Mountain-Mahogany-*cercocarpus ledifolius*

- *Leaves are evergreen, aromatic, resinous and green above, thick, leathery, with edges curled under slightly, and densely white hairy below
- *Flowers are small and yellowish
- *Bark is brownish red
- *Growth can reach up to 15-25 feet with a trunk up to a foot in diameter
- *Elevation is from 5,000-10,000 feet in dry, gravelly slopes
- *Wood is extremely heavy, hard and dense

Mountain Lover-*pachystima myrsinites*

- *Leaves are oval, thick, and small with slightly toothed edges
- *Flowers are minute, 4-petalled, red-brown, and found in the leaf axils
- *Growth is no more than two feet high
- *Elevation is from 6,000-10,000 feet in deep forests under shrubs and trees

Greenleaf Manzanita-*arctostaphylos patula*

- *Leaves are thick, bright green, nearly oval, with edges toward the sun to retard evaporation
- *Flowers are waxy, urn-shaped, and pinkish white
- *Fruit are shaped like flattened marbles and are yellowish brown to creamy white
- *Twigs are twisted and mahogany red
- *Elevation is from 6,000-9,000 feet on open ground and forest openings in well-drained, acid soils
- *Leaves and fruits may have a diuretic effect if eaten

Rubber Rabbitbrush-*chrysothamnus nauseosus*

- *Flowers are grown in dense masses of golden clusters with up to a dozen tubular flowers in each flower head
- *Twigs are covered with felt like matted hairs
- *Bark is woody, gray-brown, and shallowly fissured

- *Grows to be between 2-5 feet tall
- *Elevation is from 2,000-8,000 feet in dry slopes, mesas, & roadsides

Big Sagebrush-artemisia tridentata

- *Leaves are 3-parted, silvery, hairy, and wedge shaped
- *Grows between 2-7 feet tall with a trunk of 3 inches in diameter
- *Elevation is from 4,500-10,000 on dry plains, mesas, and rocky places
- *Known to cause hayfever

Western Serviceberry-amelanchier alnifolia

- *Leaves are 1-2 inches long, broad oval to round, and dark green above, and paler beneath
- *Twigs are slender, red-brown to gray-brown, and hairy at first and later becoming glabrous
- *Flowers are in 1 inch long clusters, sweet, juicy, and edible
- *Bark is thin, brown to gray, and smooth

Mountain Snowberry-symphoricarpos oreophilus

- *Leaves are thin, smooth, and oval and light gray green above and paler below
- *Berries are a snowy, porcelain like color but not very tasty
- *Twigs are smooth and turn brown and shredded with age
- *Growth is from 2-5 feet tall
- *Elevation is from 5,500-10,000 in dry, rocky slopes, canyons, and valleys

Squawbush-rhus trilobata

- *Leaves turn bright red in the summer, have three leaflets and each one is lobed
- *Flowers appear in the spring before leaves, these are yellow
- *Fruit is dark red, sticky, hairy berries
- *Growth is 2-6 feet
- *Elevation is from 3,500-9,000 feet on dry hillsides, canyons, valleys and plains

Smooth Sumac-rhus glabra

- *Leaves are dark green, turn a bright scarlet in the fall, there are 4-8 pairs of leaflets with a single leaflet at the tip, and each are 2-5 inches long
- *Fruit is dark red, glandular
- *Twigs are thick, velvety-hairy with a milky juice
- *Bark is thin, dark brown, and smooth
- *Growth is from 3-7 feet
- *Elevation is from 5,000-7,500 in rich, moist, but well-drained soils

Tamarisk-tamarix ramosissima

- *Leaves are scaly, very small, blue-green, and feathery
- *Twigs are slender
- *Flowers have five petals, are very small, pink, and open in May
- *Bark is gray and smooth
- *Growth is from 15-20 feet

*Elevation is from 3,500-6,000 feet in sandy, moist soils, on riverbanks, lakeshores, irrigation ditches, wells and springs

*Considered an invader, also known as "Salt Cedar"

Coyote Willow-salix exigua

*Leaves are silvery with fine hairs

*Twigs are reddish if new and ashy gray when old

*Growth is at most 15 feet tall

*Elevation is from 4,000-9,000 feet on streambanks, lakeshores and irrigation ditches

Winter Fat-eurotia lanata

*Leaves are hairy, fuzzy white in appearance

*Flower clusters fluff out when gone to seed

*Growth is from 1-3 feet

*Elevation is from 2,500-8,000 feet in sandy, alkaline soils